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GUIDE TO THE AERIAL IDENTIFICATION OF SEA TURTLES IN THE U.S. ATLANTIC AND GULF OF MEXICO

By
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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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Southeast Fisheries Science Center

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Cover photo: Green sea turtle. Credit: Bethany Resnick

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Preface

NOAA's National Marine Fisheries Service (NOAA Fisheries Service) aerial survey efforts to assess the abundance and spatial distribution of sea turtles, marine mammals, and sea birds in U.S. waters of the western North Atlantic Ocean increased significantly in 2010 in response to the BP Deepwater Horizon oil spill (MC252) in the Gulf of Mexico, and an inter-agency agreement with the Bureau of Ocean Energy Management (BOEM) through which NOAA Fisheries Service agreed to conduct an Atlantic Marine Assessment Program for Protected Species (AMAPPS). The increase in aerial survey efforts led to the need for additional observer personnel. This guide was created to provide program leaders a training tool to assist new observers with the identification of sea turtle species in the U.S. Atlantic and Gulf of Mexico. The guide includes a detailed physical description and photographs of each species, as well as habitat and distribution characteristics. The information included in this guide was derived from a variety of references. References were only acknowledged in the literature cited section to keep the guide concise. While efforts were made to include aerial images of all sea turtle species found within these waters, we were limited in the availability of good quality aerial photos for green, hawksbill, and olive ridley turtles. In addition, our inexperience with aerial surveys for hawksbills and olive ridleys, as well as the scarcity of aerial descriptions available for these species, limits the information we present for them. For example, some species are likely to look very similar from the air (e.g., hawksbills and greens, and Kemp's and olive ridleys), and we are currently unsure if they can be differentiated during aerial surveys. The technical memorandum series allows for updates to documents as new information becomes available, and thus, we encourage the submission of good quality aerial photos and species descriptions from the aerial perspective to help clarify these issues. Please contact the Southeast Fisheries Science Center (SEFSC) Sea Turtle Program if you have additional information to suggest for inclusion in updates of this guide.

Introduction

All six species of sea turtles occurring in U.S. waters, the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), and olive ridley (*Lepidochelys olivacea*), are listed as endangered or threatened under the Endangered Species Act of 1973. Thus, accurate assessments are necessary to appraise the status and trends of sea turtle populations, and to monitor whether management plans are having the desired outcome.

Aerial surveys are a proven method for examining sea turtle population parameters such as abundance and distribution, and are especially beneficial since they allow large areas to be surveyed in a relatively short amount of time. However, the identification of sea turtle species during aerial surveys can be challenging and inexperienced or untrained observers are likely to be limited in their ability to identify species. In addition, because of their tendency to dive and remain submerged when startled, sea turtles often present observers with the challenge of having to identify species from a single viewing.

This guide is designed to familiarize aerial observers with distinguishing physical traits of sea turtle species commonly found in the U.S. Atlantic and Gulf of Mexico. It focuses on key physical features that can be viewed at higher altitudes, such as carapace shape, size, color, and head size relative to body size (also see Plates 1-3). Range maps are also included to show the *approximate* distribution of each species.

Tips and Considerations:

- Consider as many descriptive characteristics as possible when identifying species instead of relying on a single physical feature.
- Size perception will be influenced by altitude and the distance of the turtle from the trackline. In addition, smaller turtles should not be assumed to be one of the smaller species (e.g., Kemp's or olive ridley turtles) since young juveniles of other species may also be sighted.
- Physical characteristics such as carapace shape and head size relative to body size may be difficult to appraise if a turtle is viewed from the side or while diving. Such features may also appear distorted when a turtle is sighted underwater.
- Male and female sea turtles do not differ externally until they reach sexual maturity, at which time the tail of males will elongate and thicken (Fig. 1). The tail of adult females remains short, and barely extends beyond the carapace.

Fig. 1. Adult male loggerhead turtle. Credit: Alejandro Fallabrino

- When determining a turtle is male based on tail length, ensure that it is the tail that is visible, and not trailing fish (Fig. 2) or the rear flippers.

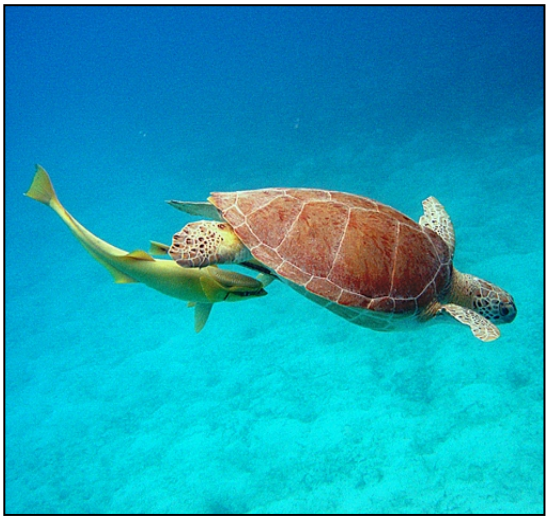

Fig. 2. Green turtle pursued by remora. Credit: Caroline Rogers

- Carapace color may be concealed or altered by extensive coverage of barnacles and algae (Fig. 3).

Fig. 3. Barnacle and algae covered carapace of a loggerhead turtle. Credit: NMFS SEFSC

- Young juvenile turtles (Fig. 4) may vary in color from older juveniles and adults (Fig. 5) of the same species.

Fig. 4. Dark colored carapace of a juvenile Kemp's ridley sea turtle. Credit: NMFS SEFSC

Fig. 5. Light colored carapace of an adult Kemp's ridley sea turtle. Credit: Adrienne McCracken

- The coloration of individuals within a species may vary significantly (Fig. 6).

Fig. 6. Color variation of juvenile green turtles. Credit: NMFS SEFSC

- Sea turtles are easier to detect when their coloration is in contrast to the color of the water (Compare Figs. 7 and 8).

Fig. 7. Highly visible Kemp's ridley turtle. Credit: NMFS SEFSC

Fig. 8. Less visible leatherback turtle. Credit: Florida Fish and Wildlife Conservation Commission

- Glare and sea state will also influence the detection of turtles (Compare Figs. 9 and 10).

Fig. 9. Highly visible loggerhead turtle in calm seas with no glare. Credit: NMFS SEFSC

Fig. 10. Less visible hard-shelled species in rougher seas and moderate glare. Credit: NMFS SEFSC

Species Accounts

LEATHERBACK SEA TURTLE

Dermochelys coriacea
Family: Dermochelyidae

DESCRIPTION:

Color: Carapace and body are dark gray/black with pale pink/blue spots (Fig. 11). Plastron is white with dark spots.

Size: Largest marine turtle. Adults attain a CCL of 130-210 cm (4.3-6.9 ft.), and a weight of 250-900 kg (550-1,980 lb.).

Body/Shell: Leathery carapace and body. Elongated carapace with longitudinal ridges (keels) (Fig. 12). Broad, triangular-shaped head. Front flippers may be longer than half the length of the body. Rear flippers are paddle-shaped.

Distinguishing features from the air: Large, dark body and head. Carapace ridges and spots may be visible from the air. Long and wide front flippers. In warm water, may have remoras attached or in close approximation.

DISTRIBUTION: Globally distributed, occurring from sub-arctic to tropical waters (Fig. 13). In U.S. Atlantic waters, leatherback turtles occur from the Caribbean and Gulf of Mexico to Maine (see Plate 4); some populations may undertake seasonal migrations to foraging sites at higher latitudes in summer and lower latitudes in winter.

HABITAT: Most migratory and wide ranging of the sea turtle species. May tolerate waters as cold as 0°C. Predominantly oceanic, but also forages in continental shelf waters (<200 m). Often found in close association with jellyfish when foraging.

Fig. 11. Dark carapace of a leatherback turtle. Credit: Matthew Godfrey

Fig. 12. The longitudinal ridges on the carapace of a leatherback may be visible from the air. Credit: Scott R. Benson, NMFS SWFSC

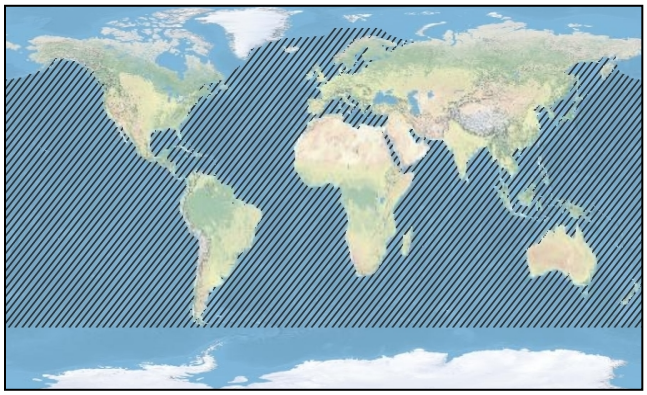

Fig. 13. Leatherback sea turtle distribution. Image modified from Wallace et al. 2010 using Halpin et al. 2009. Note: Map represents approximate range of species.

Aerial images of leatherback turtles at ~600 ft. (left column), and enlarged (right column) (Figs. 14-19). Compared to hard-shelled turtles, leatherbacks are less likely to be startled when the plane flies overhead, and will often remain on the surface of the water. Although the leatherback is the largest of the sea turtles, it may not always be the most visible. Light green or blue shades of water will contrast the dark colored turtle, while grey-brown or dark blue water may conceal it. All images are credited to NMFS SEFSC unless otherwise stated.

Fig. 14

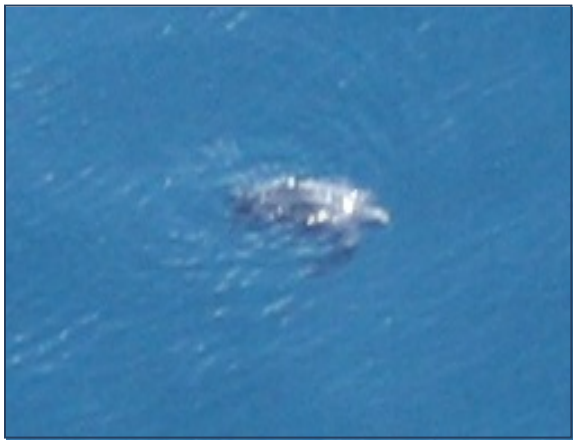

Fig. 15

Fig. 16

Fig. 17

Fig. 18. Credit: Florida Fish and Wildlife Conservation Commission

Fig. 19. Credit: Florida Fish and Wildlife Conservation Commission

LOGGERHEAD SEA TURTLE

Caretta caretta

Family: Cheloniidae

DESCRIPTION:

Color: Carapace may vary from light to dark reddish-brown (Fig. 20). Plastron is yellow. Head and flippers are light reddish-brown.

Size: Adults attain a SCL of 90-115 cm (3.0-3.7 ft.), and a weight of 100-180 kg (220-400 lb.).

Body/Shell: Heart-shaped carapace that is longer than it is wide. Distinctively large and broad head.

Distinguishing features from the air: Heart-shaped, reddish-brown carapace that is often covered by barnacles and algae. Large, broad head. Lighter areas of new growth along the edges of the carapace scutes of juveniles may be visible from the air (Fig. 21).

DISTRIBUTION: Globally distributed throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Fig. 22). In U.S. Atlantic waters, loggerhead turtles occur from the Caribbean and Gulf of Mexico to Maine. They frequently occur as far north as Cape Cod, MA, during the summer, and seldom occur north of Cape Hatteras, NC, during winter.

HABITAT: Small juveniles are oceanic. Older juveniles and adults occupy continental shelf waters including bays, estuaries, lagoons, and river mouths; some may also move back into oceanic waters.

Fig. 20. Reddish-brown carapace of a loggerhead turtle. Credit: NMFS SEFSC

Fig. 21. Lighter areas of new growth surrounding the carapace scutes of a juvenile loggerhead turtle. Credit: NMFS SEFSC

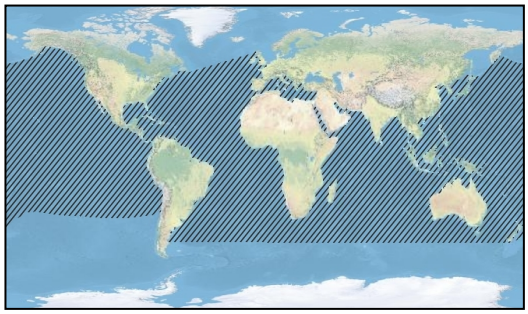

Fig. 22. Loggerhead sea turtle distribution. Image modified from Wallace et al. 2010 using Halpin et al. 2009. Note: Map represents approximate range of species.

Aerial images of loggerhead turtles at ~600 ft. (left column), and enlarged (right column) (Figs. 23-28). All images are credited to NMFS SEFSC unless otherwise stated.

Fig. 23. Credit: NMFS NEFSC

Fig. 24. Credit: NMFS NEFSC

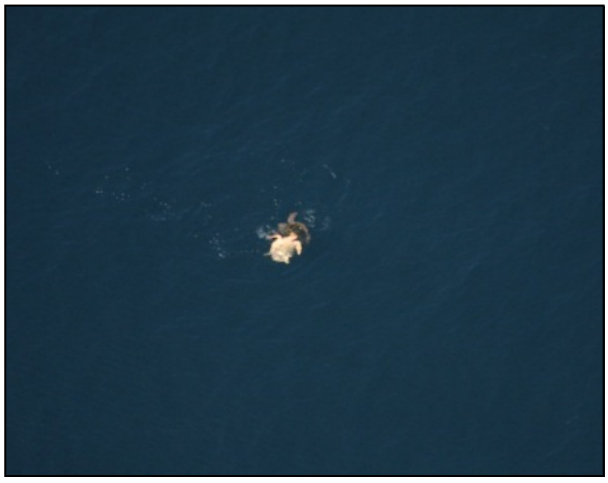

Fig. 25

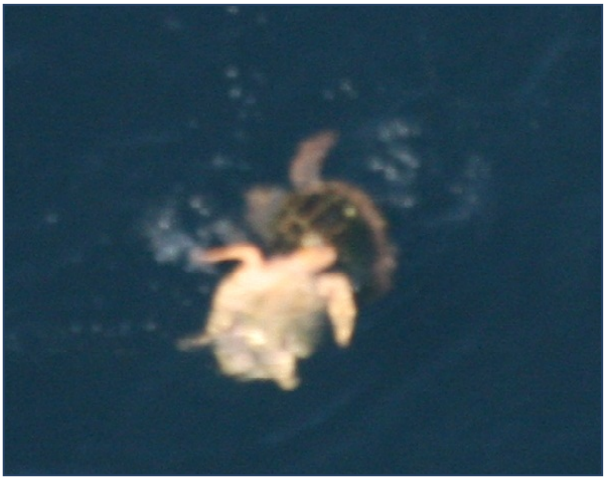

Fig. 26

Fig. 27

Fig. 28

KEMP'S RIDLEY SEA TURTLE
Lepidochelys kempii
Family: Cheloniidae

DESCRIPTION:

Color: Gray-black carapace when young that turns to a lighter olive-gray color as turtle matures (Fig. 29). White plastron. Head and limbs are gray.

Size: Adults attain a SCL of 60-70 cm (2.0-2.3 ft.), and a weight of 35-50 kg (75-110 lb.).

Body/Shell: Carapace may be as wide, or wider than it is long. Broad, pointed head.

Distinguishing features from the air: Wide, nearly circular light olive-gray carapace (Fig. 30). Large head relative to body size. Likely difficult to distinguish from an olive ridley during aerial surveys; the Kemp's ridley has a wider carapace.

DISTRIBUTION: Primarily found in nearshore areas within the Gulf of Mexico and the northwest Atlantic; ranges from Nova Scotia to Mexico (Fig. 31). In U.S. Atlantic waters, some populations may undertake seasonal migrations to foraging sites at higher latitudes in spring/summer and lower latitudes in autumn/winter.

HABITAT: Older juveniles and adults occupy continental shelf waters including bays, estuaries, lagoons, and river mouths.

Fig. 29. Light olive-gray carapace of a juvenile Kemp's ridley. Credit: NMFS SEFSC

Fig. 30. The Kemp's ridley has a wide, circular carapace. Credit: Kim B. Hull, Mote Marine Laboratory

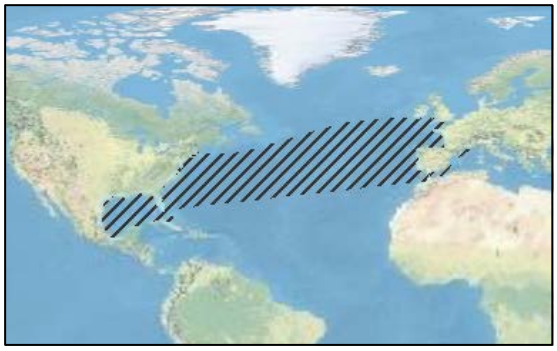

Fig. 31. Kemp's ridley sea turtle distribution. Image modified from Wallace et al. 2010 using Halpin et al. 2009. Note: Map represents approximate range of species.

Aerial images of Kemp's ridley turtles at ~600 ft. (left column), and enlarged (right column) (Figs. 32-37). All images are credited to NMFS SEFSC unless otherwise stated.

Fig. 32

Fig. 33

Fig. 34

Fig. 35

Fig. 36

Fig. 37

GREEN SEA TURTLE
Chelonia mydas
Family: Cheloniidae

DESCRIPTION:

Color: Carapace is varying shades of green, brown, grey, and black, with a mottled or starburst pattern that fades in older adults (Fig. 38). Plastron and throat are white (Fig. 39).

Size: Largest of the hard-shelled turtles. Adults attain a SCL of 90-120 cm (3.0-4.0 ft.), and a weight of 120-230 kg (400-500 lb.).

Body/Shell: Broadly oval-shaped carapace. Small, narrow head with a rounded beak.

Distinguishing features from the air: Broadly oval-shaped carapace that appears brown from the air. If underside is viewed, it will be noticeably white in color. Small, narrow head. Likely difficult to distinguish from a hawksbill during aerial surveys; the green has a wider carapace, and its beak is rounded.

DISTRIBUTION: Globally distributed, occurring primarily in the tropics and subtropics (Fig. 40). In U.S. Atlantic waters, green turtles occur from the Caribbean and Gulf of Mexico to Maine; some populations may undertake seasonal migrations to foraging sites at higher latitudes in spring/summer and lower latitudes in autumn/winter.

HABITAT: Older juveniles and adults occupy continental shelf waters containing seagrass, algae, coral and worm reefs, and rocky bottoms.

Fig. 38. Varying shades of coloration on the carapace of a green turtle. Credit: Robert P. van Dam

Fig. 39. White plastron and throat of a juvenile green turtle. Credit: NMFS SEFSC

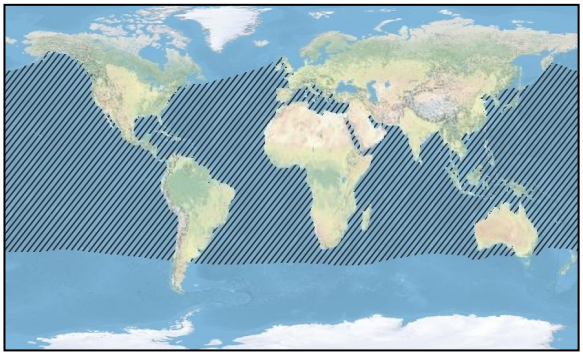

Fig. 40. Green sea turtle distribution. Image modified from Wallace et al. 2010 using Halpin et al. 2009. Note: Map represents approximate range of species.

Overhead examples of the key physical characteristics of green turtles (Figs. 41-43).

Fig. 41. Oval-shaped carapace of a juvenile green turtle. Credit: NMFS SEFSC

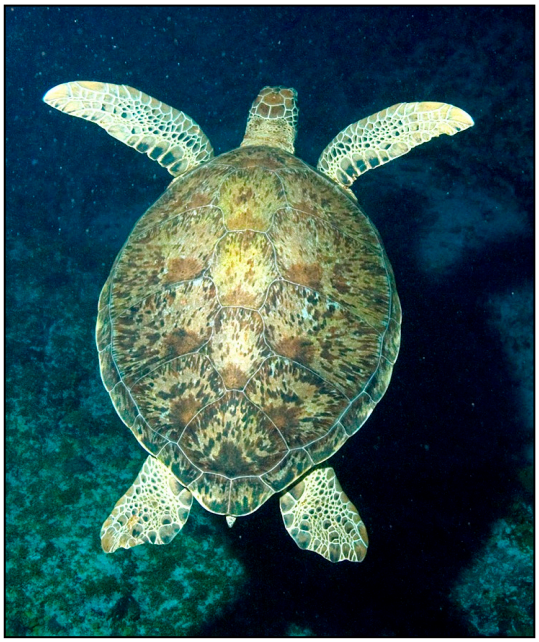

Fig. 42. Green turtles have a small head relative to body size. Credit: Projeto TAMAR, Brazil

Fig. 43. Brown colored carapace of mating green turtles. Note the elongated tail of the male on the left. Credit: Nicolas J. Pilcher

HAWKSBILL SEA TURTLE
Eretmochelys imbricata
Family: Cheloniidae

DESCRIPTION:

Color: Carapace is dark to golden-brown, with streaks of orange, red, and black (Fig. 44). Plastron is yellow and flecked with black.

Size: Adults attain a SCL of 65-90 cm (2.0-3.0 ft), and a weight of 60-80 kg (130-175 lb.).

Body/Shell: Narrow, oval-shaped carapace with a strongly serrated posterior margin and overlapping scutes (Fig. 45). Narrow, elongated head that tapers to a point with a beak-like mouth.

Distinguishing features from the air: Oval-shaped carapace. Narrow, elongated head that tapers to a point. Likely difficult to distinguish from a green turtle during aerial surveys; the hawksbill has a more elongated carapace, and its beak is pointed.

DISTRIBUTION: Globally distributed, primarily in the tropics and subtropics (Fig. 46). In U.S. Atlantic waters, hawksbills occur from the Caribbean and Gulf of Mexico to Massachusetts. Primarily found in Florida and Texas in the continental U.S.

HABITAT: Older juveniles and adults occupy continental shelf waters containing coral reefs, rocky areas, mangrove-bordered bays, estuaries, and lagoons with mud bottoms and little or no vegetation.

Fig. 44. Golden-brown colored carapace of a hawksbill turtle. Credit: Caroline Rogers

Fig. 45. The carapace of a hawksbill turtle has overlapping scutes, and a serrated posterior margin. Credit: Caroline Rogers

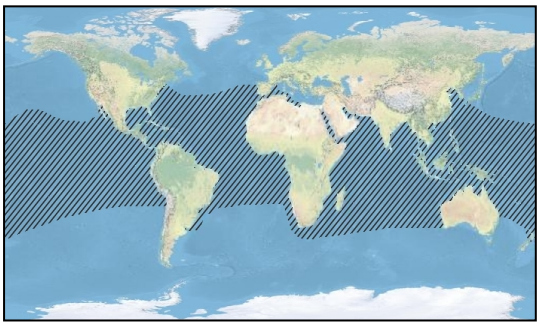

Fig. 46. Hawksbill sea turtle distribution. Image modified from Wallace et al. 2010 using Halpin et al. 2009. Note: Map represents approximate range of species.

Comparison of the beak of a hawksbill versus a green turtle (Figs. 47 and 48). Pointed beak of a hawksbill turtle viewed from underwater (Fig. 49).

Fig. 47. Pointed beak of the hawksbill turtle. Credit: Robert P. van Dam

Fig. 48. Rounded beak of the green turtle. Credit: Scott A. Eckert

Fig. 49. Underside of a hawksbill turtle on the surface of the water. Note the pointed beak. Credit: Scott A. Eckert

OLIVE RIDLEY SEA TURTLE
Lepidochelys olivacea
Family: Cheloniidae

DESCRIPTION:

Color: Grey carapace when young that turns gray to olive-green as turtle matures (Figs. 50 and 51). Creamy yellow plastron.

Size: Adults attain a SCL of 70-80 cm (2.3-2.6 ft.), and a weight of 35-60 kg (75-130 lb.).

Body/Shell: Wide carapace. Broad, pointed head.

Distinguishing features from the air: Wide, olive-green carapace. Large head relative to body size. Likely difficult to distinguish from a Kemp's ridley duringaerial surveys; the olive ridley has a more elongated carapace.

DISTRIBUTION: Globally distributed, primarily in the tropical regions of the Atlantic, Pacific, and Indian Oceans (Fig. 52). In U.S. Atlantic waters, primarily found in the Caribbean.

HABITAT: Mainly pelagic, but also known to inhabit coastal areas including estuaries and bays.

Fig. 50. Credit: Gopi Veeraswami, Wildlife Institute of India

Fig. 51. Credit: Scott Handy

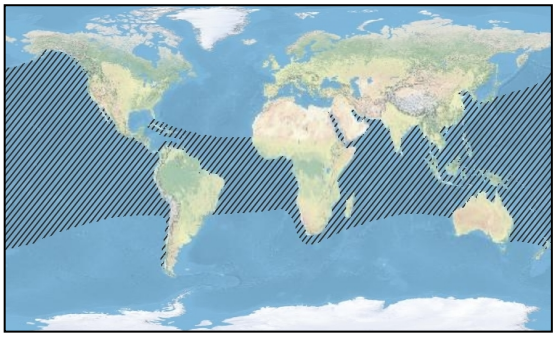

Fig. 52. Olive ridley sea turtle distribution. Image modified from Wallace et al. 2010 using Halpin et al. 2009. Note: Map represents approximate range of species.

Glossary

Carapace: Bony shield composing the top (dorsal) shell of a turtle.

Curved carapace length (CCL): Horizontal length of a turtle's upper shell from the mid-line of the nuchal scute to posterior most tip of the last marginal scute. Measured using a measuring tape.

Endangered Status: A species in danger of extinction throughout all or a significant portion of its range, as defined by the Endangered Species Act.

Oceanic zone: The vast open ocean environment (from the surface to the sea floor) where water depths are greater than 200 meters.

Pelagic: Related to deep, open ocean water. Organisms are pelagic if they occupy the water column, but not the sea floor, in either the neritic zone or oceanic zone.

Plastron: Ventral (bottom) shell of a turtle.

Scute: Scales (plates) that cover underlying bony plates of carapace and plastron.

Straight-line carapace length (SCL): Horizontal length of a turtle's upper shell from the mid-line of the nuchal scute to posterior most tip of the last marginal scute. Measured using calipers.

Threatened Status: A species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, as defined by the Endangered Species Act.

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Plate 1. Sea turtle silhouettes. Sizes are relative for adult turtles. Image modified from: Pritchard, P.C.H., and J.A. Mortimer. 1999. Taxonomy, External Morphology, and Species Identification, pp. 21-38. *In*: Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (eds.). Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

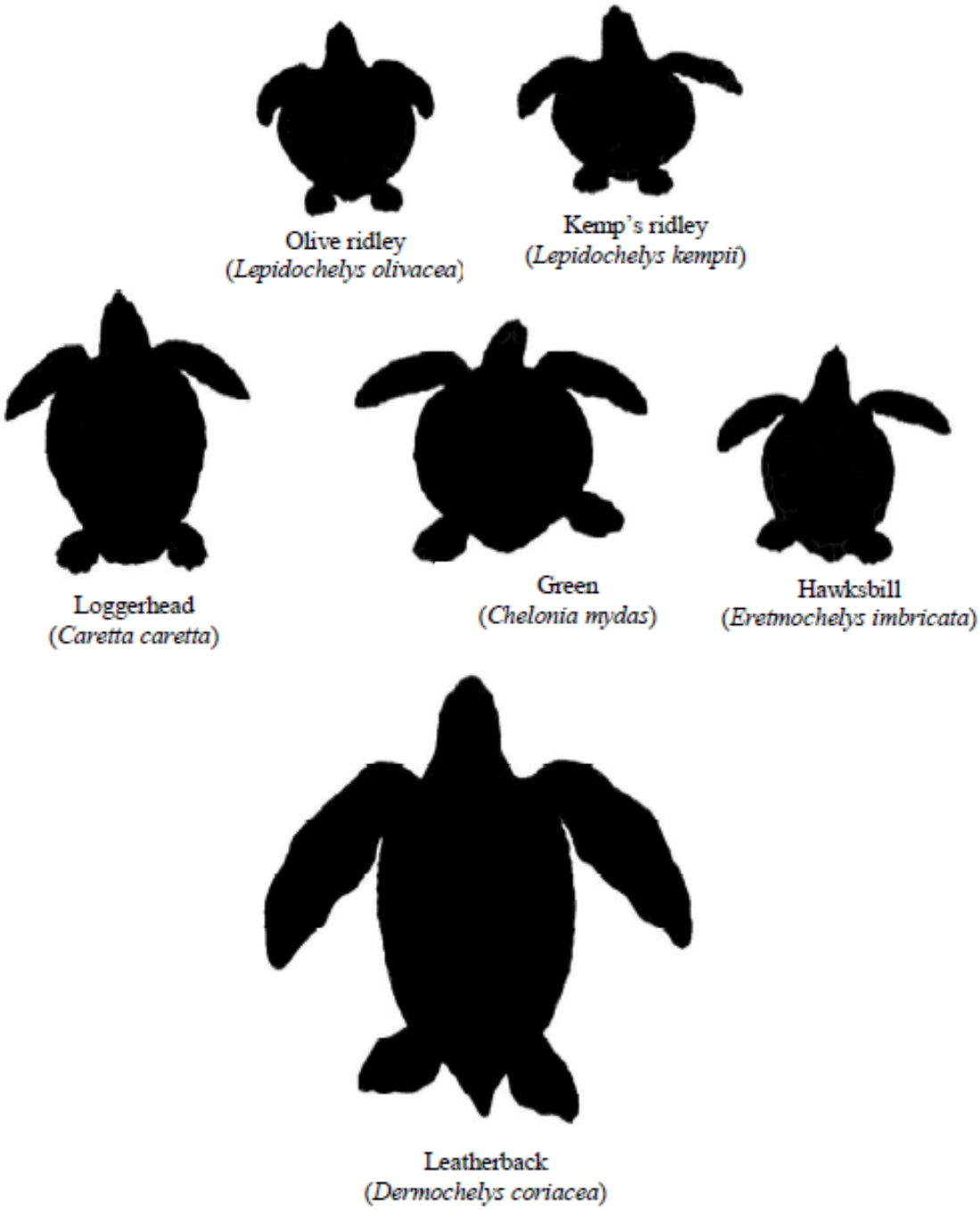


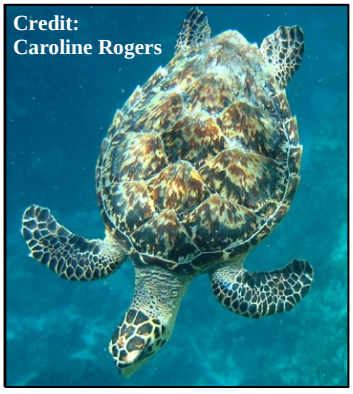
Plate 2. Overhead comparison of sea turtle species. All images are credited to NMFS SEFSC unless otherwise stated.

Olive ridley
(*Lepidochelys olivacea*)

Kemp's ridley
(*Lepidochelys kempii*)

Loggerhead
(*Caretta caretta*)

Green
(*Chelonia mydas*)



Hawksbill
(*Eretmochelys imbricata*)

Leatherback
(*Dermochelys coriacea*)

Plate 3. Species identification key for sea turtles of the U.S. Atlantic and Gulf of Mexico. NMFS SEFSC diagram modified from seaturtle.org.

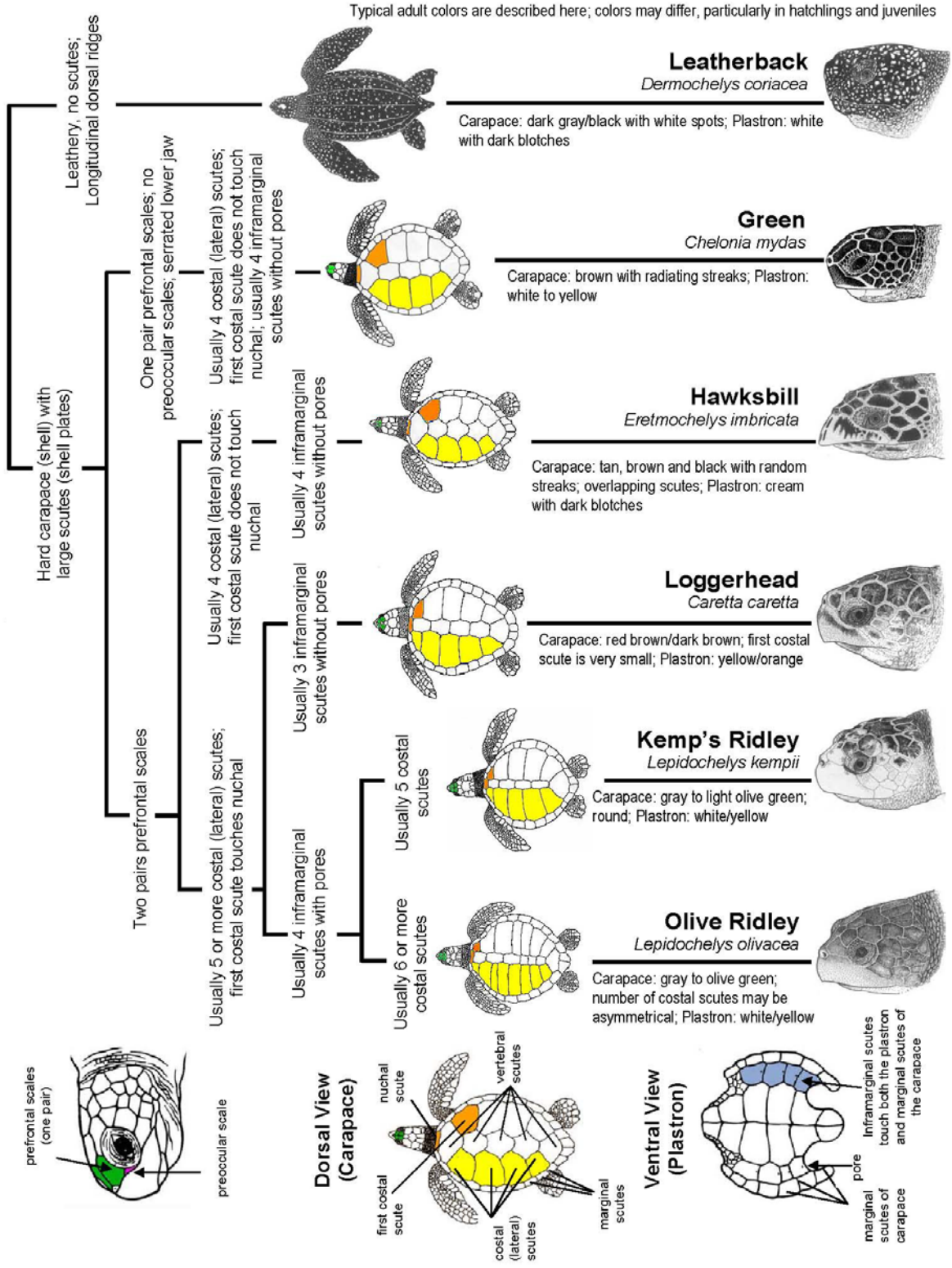


Plate 4. Map of the U.S. Atlantic and Gulf of Mexico. Image modified from ArcGIS Esri Maps and Data, Resource Center.